DEVICE AND METHOD FOR INCREASING THE SECURITY OF A VEHICLE

BACKGROUND AND SUMMARY OF THE INVENTION

[0001] The invention relates to a device for increasing the security of a vehicle, and, more particularly, to a device for increasing the security of a vehicle having an automatic transmission, which is acted upon by an electric transmission control and a detection device for detecting a critical driving situation and generating a corresponding signal.

[0002] If it is determined that vehicle security is at risk, measures should generally be taken for continuously ensuring the vehicle security. In the following, a differentiation will be made between two groups of situations with respect to the vehicle security.

[0003] On the one hand, vehicle security may relate to a stable vehicle handling. Many methods and systems for improving the directional control are known.

[0004] For example, from German patent document DE 196 35 809 A1, a method and a system are known for improving directional control in the coasting operation, in which the transmission line is interrupted by disengaging a friction clutch when the difference of the rotational wheel speeds between the driven and non-driven wheels exceeds a certain

threshold value. As a result, the directional control is increased in the coasting operation.

[0005] From German patent document DE 35 28 389 A1, a corresponding system is known for a wheel slip control.

[0006] U.S. patent document US 5,362,287 describes a control method for an automatic clutch in the case of which the transmission line is interrupted when an excessive wheel slip is detected, the wheel slip being the result of an engine braking.

[0007] In the case of automatic transmissions, it is also recommended that, when the vehicle handling is unstable or during a swerving event, the "neutral" transmission position be engaged manually in order to more rapidly return the vehicle into a stable condition. However, very few drivers are capable of removing a hand from the steering wheel during a swerving event and moving the gear selector lever to the N position.

[0008] Another group of situations is represented by driving situations in the sense of accident situations. In accident situations, it is generally provided that, for safety

reasons, a vehicle is to be stopped after an accident and any further vehicle movement is to be avoided.

[0009] For solving this problem various measures are known. For example, it is possible to interrupt the ignition or the fuel supply after an air bag is triggered, which may be used as an indicator with respect to an accident. The engine is then switched off after a corresponding event. However, it is also possible to interrupt the vehicle movement in a time-delayed manner. Furthermore, there is the risk that a disturbance exists in the engine timing unit and/or there is an interference in the signal transmission from the air bag control unit to the engine timing unit.

[0010] Furthermore, an air bag control unit is known from Japanese patent document JP 10103498, which provides a signal to a transmission control when an air bag is triggered. When the air bag is triggered, the transmission control shifts the transmission into a state with a low torque output.

[0011] It is an object of the present invention to further develop a system of the above-mentioned type for increasing the security in the case of a vehicle in order to ensure the vehicle safety in every case also during accidents and swerving events.

[0012] This object is achieved by a device for increasing the security of a vehicle having an automatic transmission, which is acted upon by an electric transmission control, and a detection device for detecting an accident or a swerving event and generating a corresponding signal. An analyzing device is provided to examine whether the generated signal reaches a certain value or exceeds a certain threshold. When the value is reached or the threshold is exceeded, the analyzing device causes the transmission control to interrupt the positive engagement of the transmission.

[0013] An essential idea of certain preferred embodiments of the present invention is the fact that the positive engagement in the transmission will be interrupted when a detection unit determines an accident or a swerving situation.

[0014] According to a first embodiment of the invention, the positive engagement in the automatic transmission will be interrupted by the electric transmission control in the event swerving starting at a defined swerving intensity. In a preferred embodiment, the transmission will then be shifted into the neutral position. In this manner, it is possible to interrupt the positive engagement in the transmission line independently and in the required manner in order to ensure high directional control of the vehicle.

[0015] According to an alternative embodiment of the invention, the transmission is controlled by the electric transmission control in the event of a triggering of an air bag and/or a rollover event such that the positive engagement in the transmission is interrupted. As a result, it is ensured that continued movement of the vehicle will be prevented even if the engine continues to run. In this case, the triggering of an air bag or the rollover event are used as an indication of the occurrence of an accident. A conclusion can be drawn with respect to the triggering of an air bag either by way of monitoring a crash sensor directly or by way of the reaction of an air bag control unit. In this sense, a triggering of an air bag is assumed even when signals are detected which lead to a triggering of an air bag.

[0016] In the above context, an embodiment of special interest is in the case wherein an automatically operable parking position is provided, which is also addressed by a control unit and which will be engaged when the vehicle has come to a stop after an air bag triggering operation and/or a rollover event. For indicating and including the vehicle speed, a normally existing vehicle speed sensor can be analyzed. Naturally, the parking position can also be engaged on the basis of other criteria. Furthermore, it is possible to immediately engage the parking position when the positive

engagement is interrupted because of the air bag triggering operation or the rollover event. In this context, reference is also made to German patent document DE 196 25 019 A1 in which, among other things, an automatic activating of the parking position is described. By activating the parking position, rolling-away is effectively prevented after a stoppage of the vehicle.

[0017] According to another preferred embodiment, a transmission selection device is provided which has a defined rest position and, for selecting a driving position desired by the driver, can be directed out of its rest position into which it will then automatically return. When the positive engagement is interrupted or a shifting into the neutral position takes place on the part of the transmission, the driver will not be confused by different adjustments of the transmission selection device, on the one hand, and of the transmission, on the other hand. Also, no synchronization problems occur as a result of absent detent positions.

[0018] Additional embodiments are defined in the subclaims.

[0019] Two simple embodiments of the present invention will be explained in detail with respect to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Figure 1 is a schematic block diagram of a device for increasing the directional control according to the invention; and

[0021] Figure 2 is a schematic block diagram of a second embodiment of the device according to the invention for increasing the security.

DETAILED DESCRIPTION OF THE DRAWINGS

[0022] According to Figure 1, an internal-combustion engine 12, which is coupled directly with a transmission 10, is arranged in a vehicle which is not shown. An output shaft 14 extends from the transmission 10 in the direction of the wheels which are not shown.

[0023] The transmission is an automatic range transmission which is shifted by means of an electric transmission control 16. The transmission control 16 receives its input information from a bus 18 (such as a CAN bus). It has an interface which is not described in detail and which is coupled with the bus 18 (reference number 20) and which filters the required information out of the information present on the bus.

[0024] In the first embodiment, information concerning rotational wheel speeds N_1 to N_4 is present on the bus 20, which is fed into the bus 18 by corresponding rotational wheel speed sensors 22 to 28. In addition, information concerning the yaw rate G is present on the bus 20, which yaw rate G is fed by a yaw sensor 30.

[0025] The electric transmission control 16 continuously determines a swerve value from the signals N_1 to N_4 and G and compares this swerve value with a limit value stored in the transmission control 16. If the swerve value exceeds the defined limit value, the transmission 10 shifts into its neutral position whereby the positive engagement in the transmission line is interrupted.

[0026] As an alternative, the signals of other sensors or detection devices which permit a conclusion with respect to a swerving event can naturally also be analyzed.

[0027] In certain critical situations in which an interruption of the transmission line is helpful, the driver must therefore no longer manually shift the transmission into the neutral position. On the contrary, this is carried out by the vehicle itself.

[0028] An alternative embodiment of the invention is illustrated in Figure 2. In this case, an internal-combustion engine 112 is arranged in a vehicle, which is also not shown. This internal-combustion engine 112 is again directly coupled with a transmission 110. An output shaft 114 extends from the transmission 110 in the direction of the wheels which are not shown.

[0029] The transmission 114 is an automatic range transmission which is shifted by means of an electric transmission control 116. The transmission control 116 receives its input information from a bus 118. The transmission control 116 has an interface 120 which is not described in detail and which is coupled with the bus 118 and filters the required information out of the information present on the bus 118.

[0030] In a second embodiment, information concerning air bag triggering events, specifically signals AN_1 to AN_4, are present on the bus 120. These signals are fed by corresponding air bag triggering devices 122 to 128, for example, crash sensors or an air bag control unit, into the bus 118. Furthermore, information concerning a rollover event Ü is present on the bus 120, which information is fed by a rollover sensor 130.

[0031] The electric transmission control 116 now continuously monitors the existing air bag triggering and rollover signals. When a triggering of an air bag or a rollover event is detected, the transmission 110 is shifted such that its positive engagement is interrupted. Thus, no more torque is transmitted from the engine 112 to the driving wheels and a continued movement of the vehicle is effectively prevented.

[0032] As an alternative, naturally the signals of other sensors or detection devices can also be analyzed, from which a conclusion can then be drawn with respect to a situation in which the positive engagement in the transmission should be interrupted.

[0033] In critical situations in which an interruption of the positive engagement in the transmission line or in the transmission is helpful, the driver therefore no longer has to manually shift the transmission into the neutral position. On the contrary, the vehicle itself achieves an interruption of the transmission line and, as a further development, a locking of the wheels.

[0034] Since the above-mentioned applications can be implemented by a corresponding modification of the

transmission software, a particularly cost-effective implementation is possible.